GROWING SMALL FRUITS IN THE HOME GARDEN

UNIVERSITY OF ILLINOIS • COLLEGE OF AGRICULTURE • COOPERATIVE EXTENSION SERVICE

CIRCULAR 935

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Acknowledgments: Figs. 1 and 7 courtesy of University of Wisconsin; Figs. 2, 13, 16, 17, 21, 22, and 29 courtesy of U.S. Department of Agriculture; Figs. 3, 14, 15, and 19 courtesy of C. C. Zych, Jr.; Fig. 6 courtesy of R. K. Simons; Figs. 23, 26, 27, 28, and 30 courtesy of Rutgers University. All other illustrations made by the authors.

Urbana, Illinois April, 1966

Cooperative Extension Work, University of Illinois, College of Agriculture, and U.S. Department of Agriculture, cooperating. JOHN B. CLAAR, *Director*. Acts approved by Congress May 8 and June 30, 1914.

GROWING SMALL FRUITS IN THE HOME GARDEN offers many advantages to the family that is able to provide the space and care required. All of the major small fruits — strawberries, raspberries, blackberries, blueberries, currants, gooseberries, and grapes — may be successfully grown almost everywhere in Illinois. Small fruits (which are so called because the edible fruit is produced on a small perennial plant) may be grown when space is limited, and are popular even for small city lots. Space limitations can be overcome by fitting small fruit plants into the overall landscape in shrub borders, screen plantings, arbors, hedges, or perennial gardens.

A well-planned garden will supply fresh fruit from early spring to the first killing frost in the fall. The fruits produced in the garden will be appreciated for their pleasing taste and for their dietary value as sources of vitamins, minerals, and acids. Fruit of the best varieties harvested at peak quality from a home garden cannot be matched in the market, and surplus production can be canned, frozen, or preserved for use during the rest of the year.

Aside from the benefits of superior quality, cultivating small fruits at home can provide much pleasure and satisfaction. Careful selection of early and late varieties of different kinds of small fruits will supply fresh fruit over the longest possible season. Success, of course, depends upon careful attention to cultural details. This circular describes cultural techniques and varieties for reliable production in Illinois home gardens.

Size of Planting. The number of plants that the home gardener can grow is determined by the space available and the needs of the family. Home fruit plantings should be limited in size, especially if the primary objective is to supply fresh fruit for home use. Large plantings may be justified for local sales or for a 4-H project. Don't plant more than you can care for properly. Neglected plants will produce low yields, and will harbor many insects and diseases.

A guide to plant spacings, approximate yields, and a suggested number of plants for a family of five is given in the table on page 5. The yields shown are dependent upon good care and management. The size and layout of the garden may vary according to the selection of fruits desired and the space and location available. When arranging small fruits in the garden, place the taller-growing fruits, such as trellised grapes, north of low-growing fruits, such as strawberries.

Location. It is desirable to locate the small fruit garden near the house. If large trees are nearby, locate the garden to the south of them if possible. There is an advantage in planting adjacent to the vegetable garden for convenience of doing cultural chores. But sometimes the most convenient location does not have the most desirable exposure, soil, or water drainage.

The site should have reasonably fertile soil and be well drained. Avoid areas that collect water after a rain. A moderately elevated or sloping site which provides air drainage will reduce losses from late spring frosts. Exposure to full sunlight is preferred, although most small fruits will grow in locations shaded during a part of the day. Where practical, take advantage of natural windbreaks such as buildings and hedgerows to protect the planting from severe winter winds which usually prevail from the northwest in Illinois.

Strawberries or brambles should not be grown for three years following tomatoes, potatoes, peppers, eggplant, melons, cotton, okra, or roses. Certain soil-borne wilt diseases are common to these crops and can result in severe losses if they are not rotated with nonsusceptible crops.

Preparing the Soil. Most small fruit plants occupy the same location for several years. Therefore, it is desirable to build up the soil fertility of the proposed location. Planning one or two years ahead can also help to reduce weed problems.

All small fruit plants benefit from the addition of organic matter to the soil. If well-rotted manure is available, apply 4 bushels per 100 square feet (1,000 to 1,500 pounds per 1,000 square feet) in the summer or fall before planting. Add 25 pounds of 20-percent superphosphate for each 1,000 pounds of manure. Thoroughly work the manure into the soil. Compost, decomposed leaves, or lawn clippings may also be used. In September, sow a cover crop, such as rye, at 3 pounds of seed per 1,000 square feet. Turn under in early spring to improve the soil.

Weeds can be reduced by planting small fruits where row crops have been cultivated for one or two years (with the exception of certain crops, see above). The cultivation and hoeing destroy many weeds and help provide good soil conditions by thoroughly mixing organic matter in the soil.

If sod must be turned under, it should be done in the fall to allow decomposition to begin. Better yet, sod should be turned under and the ground cultivated at least one year prior to planting. Treat the soil to control harmful soil insects (see pages 45 to 51).

SPACING, BEARING AGE, AND PRODUCTION OF SMALL FRUITS

Fruit[a]	Planting distance[b]		Interval from planting to fruiting	Life of plants	Height of mature plant	Estimated annual yield per plant[c]	Suggested number of plants for family of 5
	Between rows	Between plants					
	feet	*feet*	*years*	*years*	*feet*		
Strawberries (matted row)	4	2	1	3–4	1	½–1 qt. per foot of row	100
Currants	6–8	4	2	12–15	3–4	3–4 quarts	4–6
Gooseberries	6–8	4	2	12–15	3–4	4–5 quarts	4–6
Raspberries							
Red	6–8	3–4	1	8–10	4–5	1½ quarts	20–25
Black	6–8	3–4	1	8–10	4–5	1 quart	20–25
Purple	6–8	3–4	1	8–10	4–5	1 quart	20–25
Blackberries							
Erect	6–8	4–5	1	10–12	3–5	1 quart	15–20
Trailing	6–8	6–8	1	8–10	6–8 (staked or trellis)	3–4 quarts	8–10
Blueberries	8–10	6–8	2	20+	6–10	3–4 quarts	8–10
Grapes	8–10	8–10	3	20+	6 (trellised)	¼–½ bushel	5–10
Everbearing strawberries (hills)	1–1½	1–1½	½	2–3	1	½ quart	100
Everbearing raspberries	8	3	½	8–10	4–5	1 quart—spring ½ quart—fall	15–20 15–20

[a] Listed in approximate order of ripening from early spring to fall.
[b] Minimum suggested spacings. See discussion of plant spacings in text.
[c] At full bearing age, with good care.

All of the small fruits, except blueberries, grow satisfactorily in a soil pH range of 5.5 to 7.5. Blueberries require a pH of 4.2 to 5.2 for best growth. The pH refers to the acidity or alkalinity of the soil — with 7.0 as neutral and 6.0 to 7.0 slightly acid. See your county farm adviser for instructions on testing your soil and interpreting the results.

Before planting, work the soil as thoroughly as if planting a vegetable garden. The soil should be well pulverized, mellow, and moist.

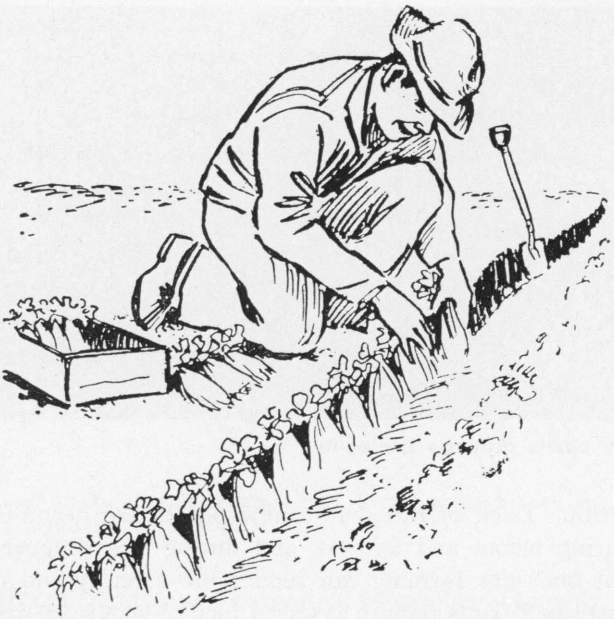
Planting Stock. Healthy, vigorous plants are essential to establish a successful small fruit planting. The disadvantages of poor planting stock can never be overcome. It is generally wiser and cheaper, in the long run, to buy the best plants available. Reputable nurseries supply disease-free and true-to-name plants. The state certificate of nursery inspection is an assurance of healthy plants. When available, the plants, and particularly strawberry plants, should be virus-free. Such plants are definitely superior and are worth the small extra cost.

You should obtain catalogs from several nurseries. (For a list of "Sources of Small Fruit Plants," Fruit Growing No. 15, write to the Department of Horticulture, University of Illinois, Urbana.) General nurseries offer most of the small fruits while others specialize in particular crops. Orders should be placed early to obtain desired varieties. December or January is not too early to order plants for the following spring. The delivery date and method of shipment should be specified when placing the order.

One-year-old plants of medium to large size are generally best. The added cost for older or extra large plants is usually not justified, the exception being blueberry plants, which should be two years old.

Choosing Varieties. Varieties for home small-fruit plantings should be selected for high quality — either for eating fresh, preserving, or both. Many varieties of high-quality small fruits are not suited to commercial production, so the only source of these quality fruits may be your own garden. Resistance to diseases and winter hardiness should be considered. Careful selection of early and late maturing varieties will provide a harvest of fresh fruit during a longer period. The use of several varieties also helps to insure a successful planting as one variety may perform highly satisfactorily in one location but not in another. The varieties suggested in this circular are generally adapted to Illinois conditions; special notation is made where a particular variety is best for a given region. In addition to the varieties suggested, gardeners should compare one or two new varieties.

Care of Plants on Arrival. Most plants are dug by nurseries in late fall or early spring when they are dormant and then shipped from



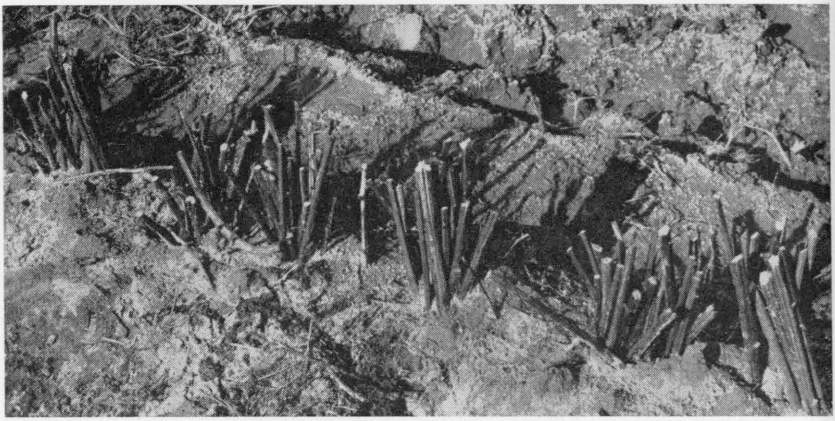
Heeling-in strawberry plants. Plants may be heeled-in after arrival from the nursery. This will prevent them from drying out before they can be set in the garden. (Fig. 1)

cold storage as orders are received. Such plants, when handled properly, are usually superior to freshly dug plants.

Open the packages and examine the plants as soon as they arrive. *Do not let the plants dry out.* If the plants are dry when they arrive, soak the roots in water for one or two hours and plant immediately if possible. If planting must be delayed more than one day, the plants may be placed in cold storage (32° to 40° F.) or "heeled-in" (see Figs. 1 and 2).

For cold storage, moisten the roots if they are dry, but be careful not to over-wet the plants or they may mold and rot. Plants in plastic bags may be kept satisfactorily for a week in your home refrigerator. Do not allow plants to freeze.

To "heel-in" plants, select a location that is well drained, shaded, and protected from the wind. Dig a trench deep enough to permit covering the roots, and long enough to spread the plants side by side one layer deep. Firm soil over the roots. (Do not cover the crown of strawberry plants.) Water thoroughly and keep shaded until ready to plant. Do not leave plants heeled-in any longer than absolutely necessary.



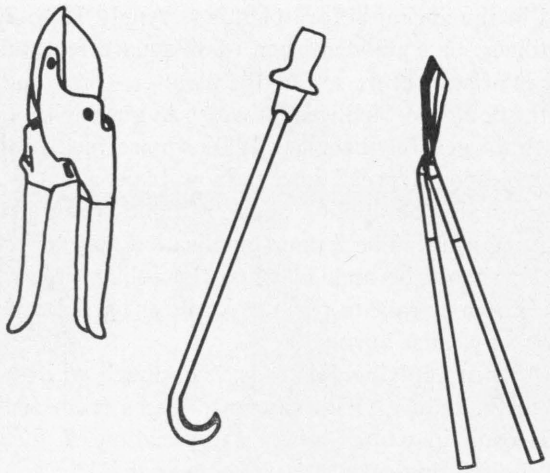
Blackberry plants properly heeled-in. **(Fig. 2)**

Irrigation. Lack of rain while new plants are becoming established, during bloom and harvest, and during late summer and fall when fruit buds are forming can reduce the quantity and quality of fruit. Most small fruits require at least 1 inch of water per week during the growing season for optimum growth. Irrigation to supplement rainfall is especially important for soils that are subject to drouth, such as sandy soils, or soils with a shallow hardpan which restricts development of a deep root system.

If possible, locate the small fruit garden where adequate water is available for irrigation. Sprinklers, porous soaking hoses, and perforated hoses are suitable for applying water. Irrigate to thoroughly wet the soil that is occupied by the roots. Shallow watering is of little value and may be harmful.

Pruning Tools. Correct pruning and training are necessary for top production of the brambles, blueberries, currants, gooseberries, and grapes. The tools needed are neither expensive nor complex (see Fig. 3). The hand shears is useful for cutting back small branches and lateral shoots, and for summer topping. The bramble hook is a specialized tool for removing entire canes of the brambles. The topping or long-handled shears is needed for larger branches and canes that cannot be cut with the hand shears. A pruning saw may be needed for grapes.

Pruning tools in good cutting condition are necessary for good pruning. Tools should be cleaned after use and their cutting surfaces wiped with an oily cloth to retard rust. The cutting edges must be kept sharp so as to make smooth, rapid-healing cuts.



Pruning tools include hand shears (left), bramble hook (center), and long-handled or lopping shears (right). (Fig. 3)

The Home Landscape. Individual or groups of small fruit plants can be included in the landscape to provide fresh fruit when space is not available for a defined fruit garden. Strawberries, particularly everbearing varieties, can be useful for ground cover plantings. Grape arbors or hedge plantings of erect blackberries, raspberries, or blueberries can be used effectively to partially screen or separate parts of the lawn or garden. Blueberries, especially, have attractive foliage coloring in the fall and therefore are useful as ornamental plants. A little imagination and careful planning can result in an eye-pleasing, as well as an appetizing, planting.

Strawberries

Strawberries are the most popular of the small fruits. They are the first fruit to ripen in the spring and are highly nutritious. A single portion of fresh strawberries supplies more than the minimum daily requirement of Vitamin C. Satisfactory crops may usually be produced in the home garden with minimum spraying.

Soil and Fertilizers. Strawberries will grow satisfactorily in most garden soils but they require a relatively high level of soil fertility for optimum production. The soil pH should be between 5.0 and 7.5. Barn manure, preferably well-rotted, may be applied the year before planting (page 4). If manure is not available, commercial fertilizer

can be added in the spring before planting. Apply 15 to 20 pounds of 10-20-20 fertilizer, or equivalent, per 1,000 square feet, and work into the top 6 inches of soil before setting the plants.

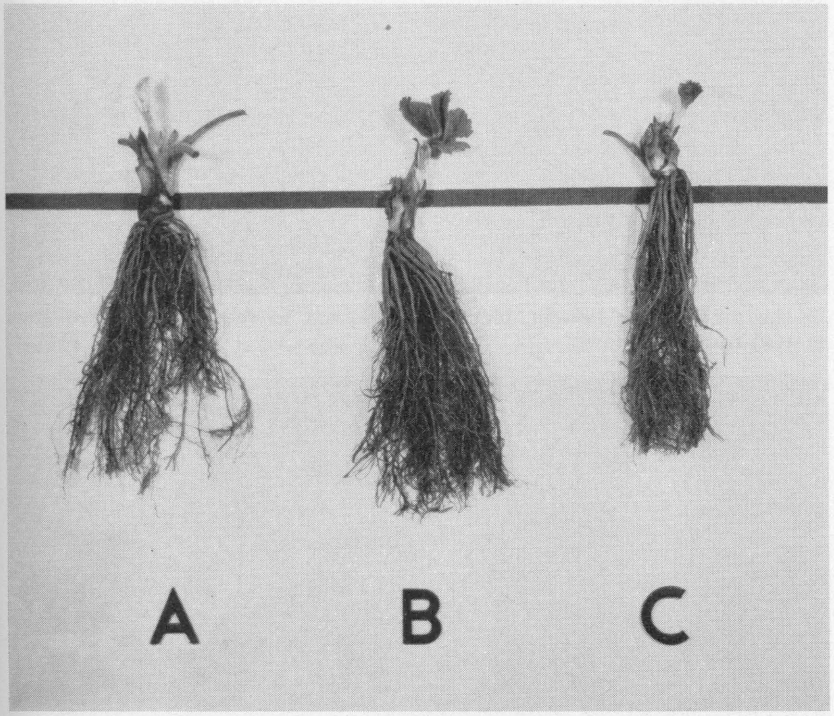
The plants should be fertilized in early August, with 4 to 6 pounds of 33-percent nitrogen fertilizer per 1,000 square feet. This amount of nitrogen (1 tablespoon spread in a narrow band about 3 inches from each plant) may also be applied about a month after planting if the plants are not vigorous. The August application may be broadcast over the rows but it should be applied when the foliage is dry. Brush the leaves with a broom or rake to remove fertilizer particles, for if allowed to remain they may cause burning.

Be careful when applying fertilizer. Too much will cause excessive vegetative growth, reduce yields, increase losses from fruit and foliar diseases, and result in winter injury. Application of fertilizer during the spring of the fruiting year is not recommended.

Planting and Spacing. Strawberries should be planted as soon as the ground can be prepared in the spring. Planting is best done in March or April in Illinois to allow the plants to become well established before hot summer weather. If possible, the plants should be set during cloudy weather or during the late afternoon or evening. Set the plants to the proper depth and apply 1 pint of water per plant (see Fig. 5).

The matted-row system (see Fig. 6) is the most popular method for growing June-bearing (standard) varieties in Illinois. The plants should be set 24 inches apart in rows 3½ to 4 feet apart. The runner plants are allowed to root freely to form a matted row about 2 feet wide.

Strawberries are a popular small fruit and are easily grown throughout Illinois. (Fig. 4)



Set the plants at the correct depth. Plant A is set correctly. Plant B is too deep, and plant C too shallow. The soil should just cover the tops of the roots. (Fig. 5)

STRAWBERRY VARIETIES FOR HOME GARDENS IN ILLINOIS

Variety	Best adapted to northern (N) or southern (S) Illinois	Season	Dessert quality	Freezing quality	Yield
Armore	S	Late	Good	Fair	Good
Blakemore	S	Early	Fair	Good	Fair
Catskill	N	Midseason	Good	Poor	Very good
Earlidawn	N, S	Very early	Fair	Very good	Fair
Fairfax	N, S	Midseason	Excellent	Fair	Fair
Fairpeake	N	Late	Excellent	Poor	Fair
Midland	N	Early	Excellent	Good	Good
Midway	N, S	Midseason	Good	Good	Good
Pocahontas	N, S	Midseason	Good	Very good	Good
Redglow	N, S	Early	Good	Very good	Fair
Sparkle	N	Late	Very good	Very good	Good
Sunrise	S	Early	Fair	Poor	Good
Surecrop	N, S	Midseason	Good	Good	Very good
Tennessee Beauty	N, S	Late	Good	Very good	Good

In the matted-row system, plants are allowed to root freely. Two good matted rows are shown. (Fig. 6)

In the spaced-row system, runner plants are placed by hand to grow 4 or more inches apart. (Fig. 7)

Everbearing strawberries growing in the hill system. The planting shown is arranged in 4-row beds and is mulched with ground corncobs. (Fig. 8)

The spaced-row system (see Fig. 7) is a modification of the matted-row system. The original mother plants are set at the same spacings, but the runner plants are spaced to take root not closer than 4 inches apart. After a spaced row about 2 feet wide is obtained, all new runners are removed. These plants will have optimum growing conditions since strawberry rows can often be too dense for good production. Spaced-row culture requires more care than matted-row culture but higher yields, larger berries, and fewer disease problems justify the extra effort.

The hill system (see Fig. 8) is the best method to grow everbearing varieties. All runners are removed so that only the original plant is left to grow. This enables the original plant to develop numerous crowns and flower stalks. The plants are set 1 to 1½ feet apart in rows that are 1 to 1½ feet apart. Usually rows are arranged in groups of 3 or 4, with a 2-foot walkway between each group of rows. The planting should be cultivated and hoed for the first 2 or 3 weeks, and then the entire bed may be mulched with sawdust, ground corncobs, or straw.

Remove Blossoms. The flower stems should be removed from newly-set plants during the first summer as soon as they appear. Allowing the fruit to develop during the first season will reduce the crop the next year. Flowers that develop after July 1 on everbearing varieties should be left for a late summer or fall crop.

Weeds. Cultivation and hand hoeing should begin soon after the plants are set. This will control weeds and help runners take root. Repeated cultivation every 10 to 14 days is most effective since weeds are easiest to kill when they are small. Cultivation should be shallow around the plants to prevent injury to the roots.

Chemical herbicides can be used to help control weeds but they are generally impractical for small gardens. Contact your county farm adviser for more information.

Mulching. Strawberries should be mulched to protect the plants during extreme cold winter weather and against damage from heaving during alternate freezing and thrawing weather. Mulching also conserves soil moisture, keeps the berries clean, and provides better picking conditions. Use a loose organic material such as clean, seed-free wheat straw. Straw can also be used to cover the plants temporarily during cold nights to protect the flowers from frost injury.

Apply straw mulch after several frosts in the fall, but before the temperature drops below 20° F. This generally occurs between mid-November and mid-December in Illinois. Apply 100 to 150 pounds of

straw per 1,000 square feet (2 to 4 bales) 3 to 4 inches deep over the rows.

Remove part of the straw from the plants in the spring when new growth starts. Put the excess straw between the rows. In the hill system, ground corncobs or sawdust may be used as a soil mulch during the growing season. Apply sawdust or corncobs in a layer 1 to 2 inches deep. About 4 cubic yards are needed to cover 1,000 square feet. Straw mulch for winter protection should be used over the plants when these materials are used as a soil mulch.

Frost Control. Strawberry buds, blooms, and immature fruits are very susceptible to frost and freezing damage in early spring (see Fig. 9). These losses can be prevented by covering the plants with straw or by careful and timely application of irrigation water. Irriga-

The blossoms with black centers at lower left were killed by frost. This injury could have been prevented by sprinkler irrigation or by covering with mulch. (Fig. 9)

tion water should be applied when the temperature at plant level reaches 32° or 33° F. Mist type sprinklers that put out a minimum quantity of water should be used to prevent unnecessary flooding. A finely perforated plastic hose may also be used. Continue to irrigate until temperatures are above freezing in the morning. Water will freeze on the plants during the night, but will not injure the blooms as long as water is being applied during the entire period of freezing temperatures.

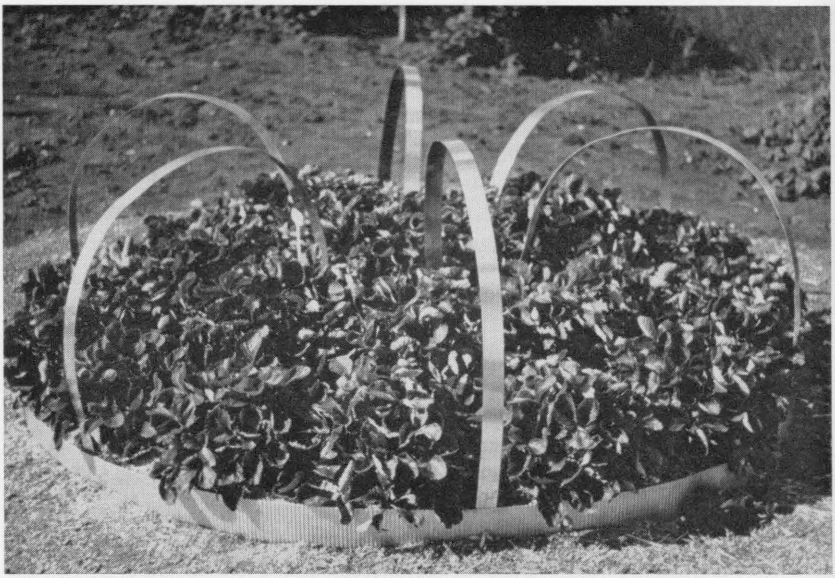
Straw may also be raked over the rows for protection. If this is done, remove the straw during the day, and only cover the plants on nights when there is danger of frost.

Renewing the Patch. Properly managed strawberries will bear fruit more than one year. Usually a patch may be picked 2 to 4 years, but only good plantings should be maintained. Weedy or diseased plantings are best destroyed and replaced.

Immediately after the harvest is completed, the strawberry planting should be renovated to achieve good production the next year. First, mow the old foliage with a sickle, scythe, or power mower, cutting off the leaves about 1 inch above the crowns. Rake the leaves and other debris from the patch and compost or burn them. Do not mow the leaves if it cannot be done within a week after harvest is finished. Broadcast 10 to 15 pounds of 10-10-10 or 12-12-12 fertilizer per 1,000 square feet over the planting. Narrow the rows to 10 to 12 inches by hoeing or rototilling and hoe out all weeds. Irrigate thoroughly to encourage the plants to recover and make new runners for the next crop.

Everbearing Strawberries. Everbearing strawberries differ from the standard or June-bearing varieties in that they bear fruit during the spring and then bear more or less continually throughout the summer and fall until frost. Although they are popular with some home gardeners, everbearers produce only fairly good fruit in comparison with the better standard varieties. They require more attention than standard varieties, and the berries are likely to be soft and lack flavor during hot weather. Irrigation is usually necessary to produce summer and fall crops.

Everbearing strawberries may be grown in terraced beds, pyramids, and barrels by home gardeners who have limited space available. Everbearing strawberries may also be used as edging plants or as ground covers in the landscape plan. Sometimes they are grown as potted house plants or trained on "totem poles." (If grown indoors, the plants must have good light and the blossoms must be pollinated by hand to develop well-formed berries.) Although these methods are not as productive as the conventional systems, they do have ornamental value.



Strawberries may be grown successfully in pyramids when space is limited. Each plant may be expected to produce from 1 pint to 1 quart of berries in a growing season. (Fig. 10)

Terraced beds may be constructed in various shapes to fit a given area by using retaining walls of wood, concrete, metal, asbestos siding, or almost any material that is rigid enough to serve the purpose. The individual beds should be 8 to 12 inches wide and 6 to 8 inches deep. One row of plants spaced 12 inches apart may be set in each bed. A popular terraced bed is the pyramid which may be purchased as a unit with retaining walls, plastic cover, net for bird protection, and sprinkling device (see Fig. 10). A pyramid of 50 plants should produce about 35 quarts of berries during the first growing season.

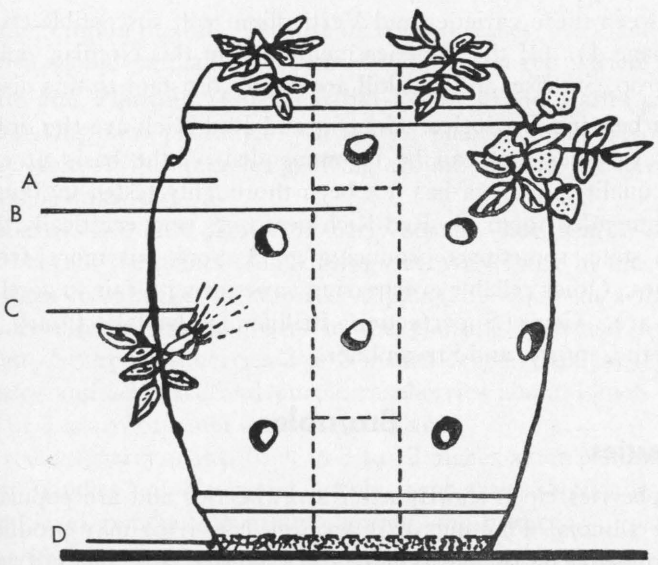
Strawberry barrels (Fig. 11) require less space than terraced beds, but they are less productive and more difficult to manage. Almost any type of barrel may be used for this purpose. With a 2-inch auger, bore 3 or 4 holes in the bottom of the barrel and a series of holes in the sides starting 6 inches from the bottom. Space the holes 10 to 12 inches apart completely around the barrel and 6 to 8 inches apart vertically. Stagger each series so that every hole will be centered between the two holes just below. Sunlight is important for successful growth, and the barrel must be given a half-turn at least twice a week. If it is too large to turn easily, mount the barrel on castors, an old wagon wheel, or a clothesline turntable. Otherwise, set the plants only on the east, south, and west sides of the barrel.

Place 2 inches of gravel or broken crockery in the bottom to provide drainage for excess water. A sand core is important to permit water to move to the lower rows of plants. This core may be constructed by using a 5-inch diameter tin can with both ends removed. The can is placed in the bottom of the barrel, filled with coarse sand, and gradually moved up and refilled with sand as soil is packed firmly around it.

The plants are set through the holes as the barrel is filled. Spread the roots inside the barrel so that the roots are angled slightly upward to allow for settling of the soil. Set a few plants in the top, but leave the center (sand core) open for watering. Water thoroughly when planting is completed and often enough thereafter to keep the soil fairly moist.

Small amounts of well-rotted manure or a handful of a complete fertilizer may be added every 2 or 3 weeks if the plants appear to lack vigor. The barrel should be protected during the winter by bringing it into a building or wrapping it with 6 inches of straw or other mulching material to prevent excessive drying and freezing injury.

Several varieties of so-called "climbing strawberries" are available to home gardeners for training on fences or trellises. The chief value of climbing strawberries is their novelty.



Construction of a strawberry barrel. A. Fertile garden soil. B. A core of sand for even watering, made by using a can as a form. C. Plants set with roots spread out and at a slight upward angle to allow for settling of the soil. D. Layer of gravel or broken crockery for drainage. (Fig. 11)

June-bearing Varieties. There are many varieties of strawberries, and most of them appear highly recommended in nursery catalogs. However, the home gardener should select varieties on the basis of dessert quality, preserving quality, season of maturation, and disease resistance. The June-bearing varieties listed in the table on p. 11 have proved their adaptability to Illinois. New varieties are continually being introduced so that the list is subject to change.

Although there is no sharp line of demarcation between northern and southern Illinois for strawberries, some varieties definitely perform better in a given latitude. Thus, for the purposes of this circular, northern and southern Illinois are separated by a line approximately from Quincy in Adams County to Danville in Vermilion County.

Varieties with special characteristics which should be noted by the home gardener are:

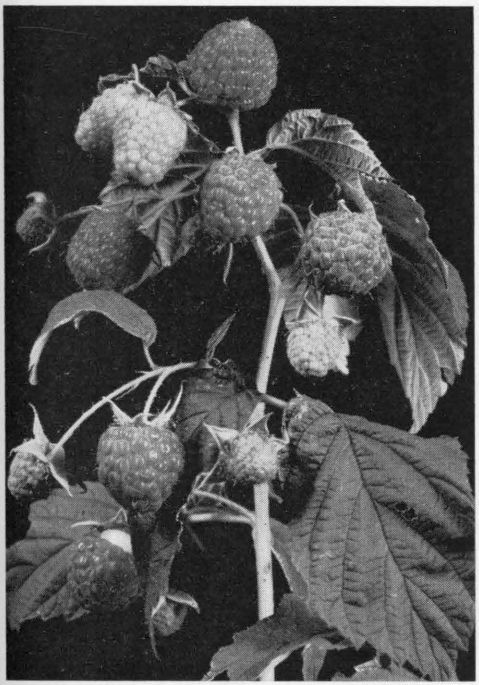
1. Very large fruit — Jerseybelle, Vesper, Catskill, Robinson.
2. Very late — Jerseybelle, Vesper, Redstar.
3. Resistant to red stele disease — Redglow, Surecrop, Sparkle, Sunrise, Midway. (Select from these varieties when the garden area is known to be infected with red stele disease.)
4. Very susceptible to Verticillium wilt disease — Earlidawn, Midland, Jerseybelle, Vesper, Redstar. Allow at least three years between these varieties and Verticillium wilt susceptible crops (see page 4). Of the varieties mentioned in this circular, only Surecrop, Sunrise, and Catskill are highly resistant to this disease.

Everbearing Varieties. Geneva and Red Rich are the only everbearing varieties that can be recommended on the basis of excellent dessert quality. Geneva has not been thoroughly tested in Illinois and is recommended for trial. Red Rich performs very erratically throughout the state, sometimes producing good crops but more frequently poor ones. Other reliable everbearing varieties with fair to good dessert quality are: Gem (Superfection, Brilliant), Ogallala, Ozark Beauty, Twentieth Century, and Streamliner.

Brambles

Raspberries

Raspberries ripen shortly after strawberries and are popular in all parts of Illinois. Plantings that are well cared for may produce good crops for 10 years or more. Red, black, purple, and yellow fruit types are available. The everbearing varieties bear one crop in the spring



Fruiting cluster of red raspberry. (Fig. 12)

and another crop in the fall. Because of virus diseases, black and purple raspberries should be planted 300 to 500 feet from red varieties.

Plants and Planting. One-year-old, No. 1 grade plants are best for establishing new plantings. Virus-free plants should be obtained when available. Wild brambles growing around or near the new planting should be destroyed.

Raspberries are best planted in early spring (late March or early April). Prevent the plants from drying out while lying in the field by placing them in a bucket of water or dipping the roots in a thin clay mud. Carefully spread the roots in the planting hole and firm soil over them. Set red raspberries 2 to 3 inches deeper than they were in the nursery and set black and purple raspberries about 1 inch deeper. Apply 1 or 2 quarts of water around each plant.

Cut red raspberry plants back to 8 to 12 inches after planting. The canes or "handles" of black and purple raspberries should be cut off at ground level, removed from the planting, and burned.

Plant Spacing and Support. Raspberries may be grown in hills or in hedgerows, and the plant spacing depends on the system of train-

RASPBERRY VARIETIES FOR HOME GARDENS IN ILLINOIS

Variety	Best adapted to northern (N) or southern (S) Illinois	Season	Dessert quality	Notes
		Red Raspberries		
Chief	N	Early	Good	Upright plants, sucker less than Latham, small fruit, very hardy.
Latham	N, S	Late	Fair	High yields, few thorns, fruit often crumbly.
Taylor	N	Late	Very good	Very large berries, free from crumbling.
Newburgh	N, S	Late	Good	Large berries, slightly earlier than Latham.
September	N, S	Everbearer	Excellent	Summer crop earlier than Latham, should support fall crop.
Sunrise	S	Very early	Good	Two weeks earlier than Latham, medium berries.
Fallred	N (trial)	Everbearer	Good	Good producer, early fall crop.
		Black Raspberries[a]		
Allen	N, S (trial)	Early	Good	Very productive, attractive fruit. Most of crop may be picked at one time.
Bristol	N	Midseason	Very good	Fruit difficult to pick unless fully mature.
Cumberland	S	Midseason	Good	Production fair.
Dundee	N, S	Midseason	Very good	Vigorous, large berries. Hard to pick after rain.
Logan	N, S	Early	Good	Originated in Illinois. Week earlier than Cumberland.
Morrison	N, S	Late	Fair	Large glossy, firm berries.
		Purple Raspberries[a]		
Clyde	N, S	Late	Good	Ripens about a week later than Sodus. Heavy producer. Tolerant of anthracnose.
Purple Autumn	N, S	Everbearer	Very good	Very large berries. Summer crop matures earlier than red variety September, and autumn crop later than September.
Sodus	N, S	Late	Good	Very large berries, plants resistant to drouth.
		Yellow Raspberries		
Amber	N, S	Very late	Very good	One of the sweetest raspberries. Late enough to extend raspberry season.

[a] Most varieties are susceptible to anthracnose. See pages 49 and 50 for control measures.

ing to be used. (See the table on page 5 and the discussion of training systems on pages 23 to 28.)

Fertilizers. For maximum production, fertilizer should be applied prior to planting (see page 4). If manure is not available, apply 2 ounces of 5-10-5 fertilizer around each plant 10 to 14 days after planting. In the second and subsequent years the plants should be fertilized with 5-10-5 fertilizer at a rate of 15 to 20 pounds per 1,000 square feet broadcast along the hedgerow, or about ½ cupful around each plant in the hill system. Apply in early spring before new growth begins.

Animal manures may also be used to fertilize established raspberry plants. In the spring before new growth begins, apply 300 to 400 pounds of cow manure per 1,000 square feet, or 100 to 200 pounds of poultry manure per 1,000 square feet.

Do not apply fertilizer during the summer or early fall. Such applications may injure the plants or may force soft succulent growth which is very susceptible to winter injury.

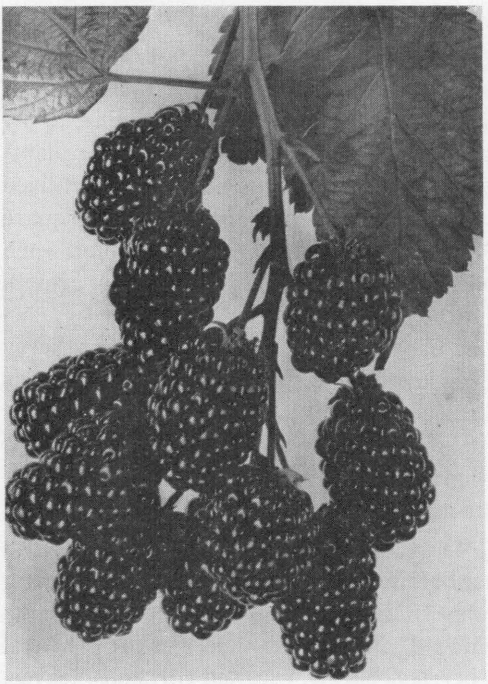
Mulching. Generally, raspberries should be cultivated during the early part of the first summer. In late summer, after the plants are established, they may be mulched. Mulched raspberries grow better, produce more, and have larger berries. Straw, crushed corncobs, leaves, and sawdust are common mulching materials. Sufficient mulch, 4 to 8 inches deep, is needed to suppress growth of weeds. Mulch material should be added each year as needed. If turf is used between the rows it is best kept closely mowed.

Plantings that are mulched with corncobs or sawdust will require extra nitrogen fertilizer during the first two years. Apply double the amounts of fertilizer recommended above. After two years, the amount of fertilizer applied may be reduced to half because the mulch will release fertilizer nutrients to the plants as it decomposes.

Blackberries

Blackberries are well suited to the home fruit garden. Erect and trailing plant types are available, and each requires different culture. The trailing varieties must be supported, and most are not very winter-hardy. Presently available trailing varieties require special care if they are to be grown in Illinois. Plant breeders are developing hardy thornless blackberry varieties which should increase interest in this luscious fruit.

Planting and Spacing. Blackberries are best planted in early spring, using the same care as for planting raspberries.



Fruiting cluster of blackberry. (Fig. 13)

Spacing will depend on the trellis and training system to be used (see pages 23 to 31). Most erect blackberry varieties can be grown without supports, spaced 4 to 5 feet apart in rows 8 to 10 feet apart.

Set the plants at the same depth as they were planted in the nursery. Cut the tops back to 6 inches. Cultivation, mulching, and fertilizers are the same as for raspberries (see page 21).

Winter Protection. Most trailing blackberry varieties are not hardy, and are suggested only for southern Illinois. With special protection they might be grown in northern areas, but even then winter injury may occur. The canes can be protected by covering lightly with soil or preferably with straw after they become dormant in the fall (about mid-December). When danger of severe cold weather is past in the spring, uncover the canes, do the dormant pruning, and tie the canes to a support.

Suggested Varieties. Sterility in some blackberry varieties has been a problem in recent years. Affected plants generally make good growth and bloom profusely but produce only a few malformed berries. If such plants occur in your garden, they are best destroyed. The va-

BLACKBERRY VARIETIES FOR HOME GARDENS IN ILLINOIS

Variety	Best adapted to northern (N) or southern (S) Illinois	Season	Dessert quality	Notes
		Erect Blackerries		
Bailey	N, S	Midseason	Good	Susceptible to orange rust.
Blowers	N, S	Midseason	Good	Susceptible to orange rust.
Darrow	N, S	Early	High	Long fruiting season, very productive. May produce some fruit in fall.
Early Harvest	S	Early	Good	Medium size berries. Originated in Illinois.
Nanticoke	N	Very late	Fair	Very thorny, long fruiting season.
Raven	N, S (trial)	Early	Very good	Large, attractive fruit, very productive.
		Trailing Blackberries (Dewberries)[a]		
Lucretia	S	Early	Good	Susceptible to anthracnose and leaf spot diseases. Large berries.
Smoothstem	S (trial)	Very late	Fair	New thornless variety, one month after Eldorado.
Thornfree	N, S (trial)	Late	Fair	New thornless variety, 3 weeks after Eldorado, hardy at Urbana.
Thornless Boysenberry	S	Late	Good	Very large berries. Do not propagate from root cuttings.

[a] Trailing blackberries require winter protection for successful culture in Illinois.

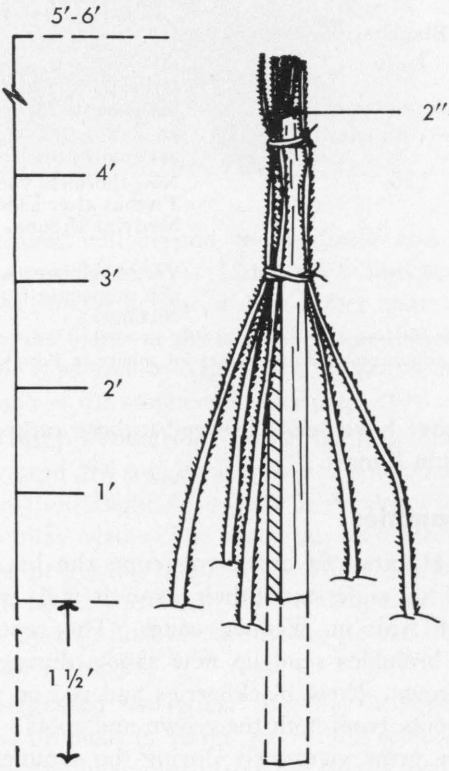
rieties listed in the table above have been observed to bear rather consistently in several locations in Illinois.

Training and Pruning Brambles

Growth and Fruiting Habits. In order to prune the brambles intelligently, it is essential to understand their growth and fruiting habits. The brambles bear fruit on biennial canes. The roots and crowns are perennial. All brambles send up new shoots during each growing season from the crown. Erect blackberries and red or yellow raspberries develop new shoots from both the crown and roots. These shoots, regardless of origin, grow vigorously during the summer, initiate flower buds in the fall, overwinter, and bear fruit the following

season. The fruit is borne on leafy shoots arising from lateral buds on one-year-old canes. The canes then gradually dry up, dying shortly after harvest. Meanwhile new shoots are developing to repeat the cycle, thus providing fruiting canes each year.

The everbearing types bear fruit twice on the same cane. The new shoots bear a crop at the tips in the fall and again the next season further down on the canes. The fruit canes of such types *should not be pruned after the fall crop* since this would remove the fruiting wood for the spring crop. However, since the everbearing varieties produce fruit abundantly on primocanes (canes of the current season's growth), it is possible to grow them solely for the fall crop by mowing all of the canes to within 2 to 3 inches of the ground in the spring before growth begins. Then only the abundant crop on the primocanes is harvested in the fall. This practice eliminates all labor of hand pruning and the



A red raspberry plant trained and pruned to the staked-hill system. (Fig. 14)

problems associated with winter injury to the overwintered canes. Common fungus diseases are also held to a minimum.

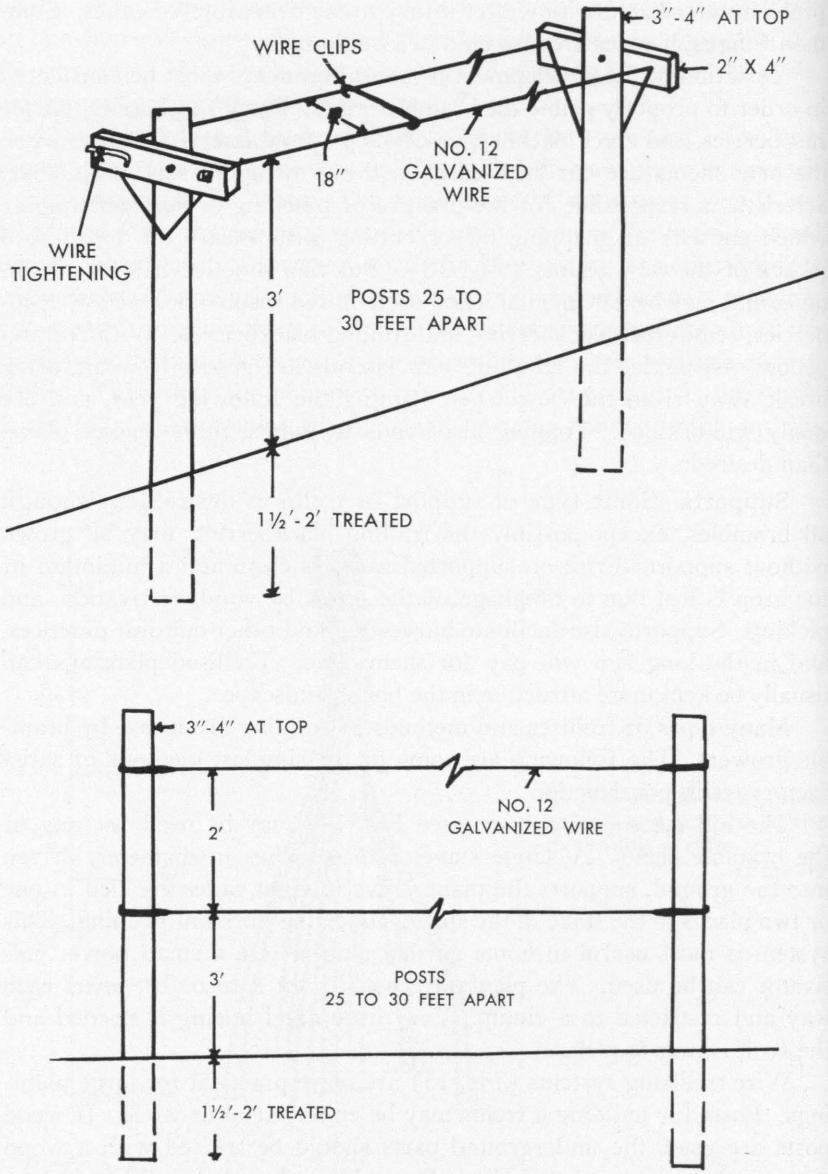
Variation in the development of lateral branches must be considered in order to properly prune the bramble fruits. Black raspberries, purple raspberries, and erect blackberries develop strong lateral branches when the new shoots are cut back early in the growing season. This characteristic is responsible for the practice of pinching or summer topping which consists of snapping off or cutting with shears the top 3 to 4 inches of the new shoots (Fig. 18). But this practice has no advantages and may be detrimental when used on red raspberries, yellow raspberries, semi-erect blackberries, and trailing blackberries. With red and yellow raspberries the resulting new laterals are generally weak, often break away from the cane when fruiting the following year, and are easily winterkilled. Topping also tends to induce more sucker plants than desired.

Supports. Some type of support or trellis is desirable, although all brambles, except possibly the trailing blackberries, may be grown without support. Fruit on supported canes is clean and a minimum of the crop is lost due to breakage of the canes by wind, cultivation, and picking. Supports also facilitate harvesting and other cultural practices, and in the long run will pay for themselves. Trellised plantings can usually be kept more attractive in the home landscape.

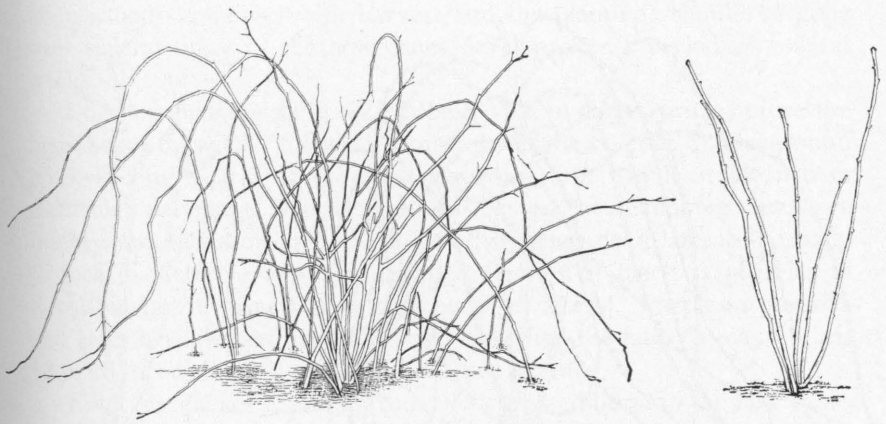
Many types of trellises and methods of training are in use by bramble growers. The following are some of the simplest methods of satisfactory trellis construction.

The hill system of culture (see Fig. 14) may be used for any of the bramble fruits. A single stake, 2 to 4 inches in diameter, driven into the ground, supports the plant. Five to eight canes are tied in one or two places to the stake in the spring following dormant pruning. This system is most useful in home garden plots where a small power cultivator can be used. The plants are usually set 4 to 6 feet apart each way and restricted to a clump. Very little hand hoeing is needed and the fruit is easy to pick.

Wire trellising systems (Fig. 15) are more practical for large plantings. Posts for building a trellis may be either metal or wood. If wood posts are used, the underground parts should be treated with a wood preservative to extend their life. Pentachlorophenol, 1 gallon (50 percent) in 10 gallons of kerosene, stove oil, diesel oil (#400), or other light oil is a satisfactory preservative. The posts should be soaked for 7 days in a 50-gallon drum containing enough of this solution to cover



Trellises. Horizontal trellis suitable for red raspberries, and which requires minimum tying of canes (top). Two-wire vertical trellis to which canes are tied (bottom). (Fig. 15)



Red raspberry plant before (left) and after (right) dormant pruning.
(Fig. 16)

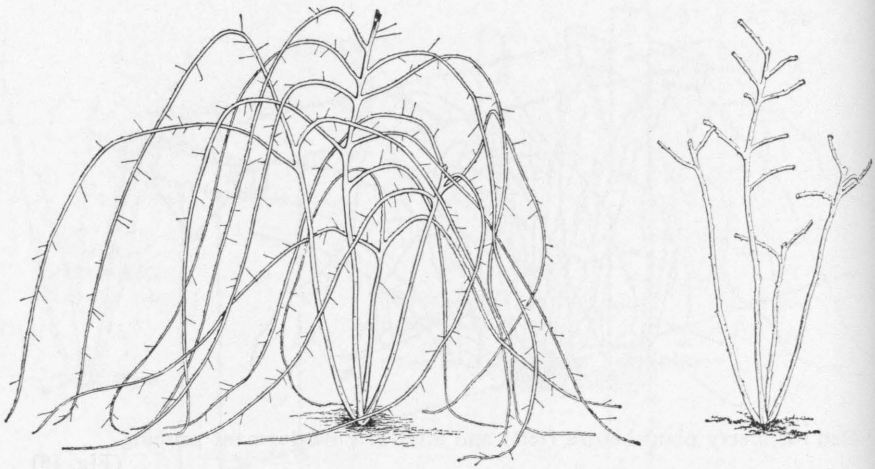
the post 3 or 4 inches above ground level. Posts should be spaced 25 to 30 feet apart in the row with the end posts braced or anchored. A 12-gauge galvanized wire is adequate for the trellis.

The horizontal trellis is used with the hedgerow system, the most common system of training. The plants form a solid row that is kept about 18 inches wide. Each spring the canes within the row are thinned so that they are about 4 to 8 inches apart. The canes are supported between the trellis wires and do not have to be tied with this system. Wire clips are used to keep the wires from spreading between the posts.

The vertical trellis is used with the linear system, a modification of the hedgerow system that allows better control of weeds, diseases, and insects. Plants are maintained in a narrow row and are tied to the trellis wires. This system is most useful with red or yellow raspberries and trailing blackberries.

Pruning Red and Yellow Raspberries. Regardless of the training system being used, these types should be pruned twice each year, once in early spring and again as soon as possible after fruiting. New shoots of red and yellow raspberries *should not be summer topped.*

Spring pruning should be done early before the buds begin to swell but after danger of severe cold is past. All short and weak canes should be removed, and the remaining vigorous canes should be thinned to 5 to 8 canes per stake in the hill system (see Fig. 14), or spaced 4 to 8 inches apart in other systems. Only the largest canes should be saved, as these are the most fruitful. Cut the remaining canes back moderately to 5 to 6 feet from the ground level. Canes shorter than 5 to 6 feet do



Black raspberry plant before (left) and after (right) pruning. Purple raspberries and erect blackberries are pruned in a similar manner. (Fig. 17)

not need to be cut back unless winter injury extends below this height. Where no support is provided, cut the canes back to about 3 or 4 feet, regardless of original height.

Fruited canes may be removed any time after harvest since they die soon after fruiting. Although this pruning may be delayed until the following spring, cutting these canes off at the ground level as soon as possible after harvest is preferred since their removal at this time encourages growth of the new shoots and reduces disease and insect problems. Remove the prunings from the planting and burn them.

The canes of the everbearing varieties are pruned the same way as ordinary varieties in the spring and following the summer harvest. The shoots that fruit in the fall at the tip bear fruit again the next spring farther down, so *do not remove these canes* after the fall harvest.

Pruning Black Raspberries, Purple Raspberries, and Erect Blackberries. These brambles should be pruned three times each year, during the summer, early spring, and after harvest.

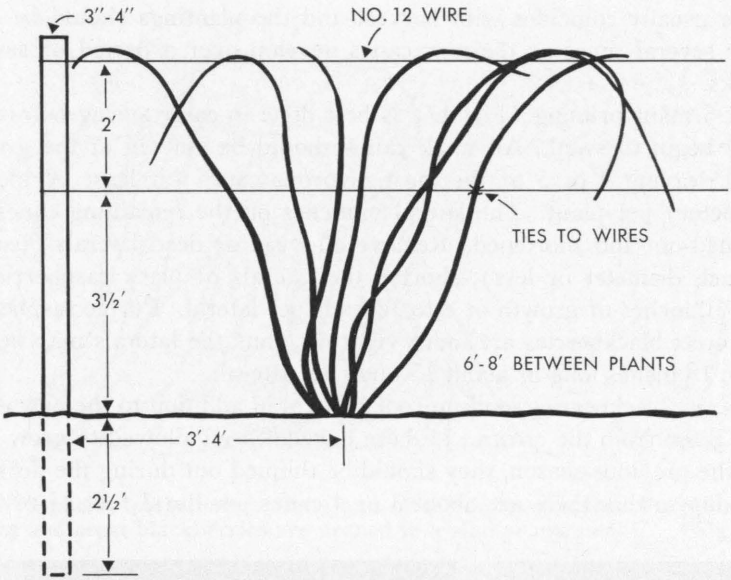
Summer pruning is an essential step in the production of these brambles. All new shoots should be pinched back 3 to 4 inches when they develop to the desired height (see Fig. 18). If grown without supports, black raspberries are pinched when the new shoots are about 24 inches high; purple raspberries and erect blackberries are pinched when they reach 30 to 36 inches. If grown with supports, the shoots may be allowed to grow 6 to 8 inches more before pinching. This oper-

ation usually coincides with harvest and the plantings should be gone over several times as the new canes develop over a period of several weeks.

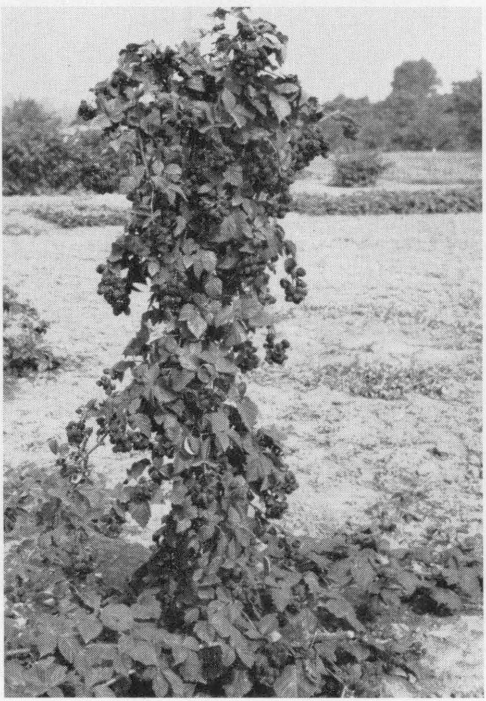
Dormant pruning (Fig. 17) is best done in early spring before the buds begin to swell. All weak canes should be cut out at the ground level, leaving 4 or 5 of the most vigorous canes (at least ½ inch in diameter) per plant. The lateral branches on the remaining canes are thinned out and shortened. Remove all weak or dead laterals (usually ¼-inch diameter or less), shorten the laterals of black raspberries to 8 to 10 inches of growth or 8 to 12 buds per lateral. Purple raspberries and erect blackberries are more vigorous, thus the laterals may be left 12 to 18 inches long or about 15 buds per lateral.

Erect blackberries send up root suckers in addition to the new canes that grow from the crown. If these have all been allowed to grow during the previous season, they should be thinned out during the dormant pruning so that there are about 3 or 4 canes per lineal foot of row. A

Black and purple raspberries and erect blackberries are pinched back 3 to 4 inches after the primocane has reached the desired height in the summer. This results in the development of lateral shoots shown in Fig. 17. (Fig. 18)



Dormant pruning and training of trailing blackberries to a two-wire vertical trellis. (Fig. 19)



A trailing blackberry plant trained and pruned to the hill system. Note the new canes growing from the base of the plant. (Fig. 20)

better practice is to remove the excess suckers during the summer between and in the rows, leaving only those desired for fruiting next season. The suckers should be pulled out if possible since they do not regrow as quickly as those that are cut off at the ground level.

Fruited canes of black and purple raspberries and erect blackberries are handled the same way as red raspberries.

Pruning Semi-Erect and Trailing Blackberries. These brambles are pruned twice, once in early spring and again after harvest. Pinching the new shoots as they develop is not practical.

Spring pruning of these brambles consists simply in selecting the best canes for tying to a support and removing the others (Figs. 19 and 20). Select the best 4 to 8 canes of semi-erect varieties, and the best 8 to 16 canes of trailing varieties. If stakes are used for support, the canes are wrapped around the stake, tied at two or three places, and cut off to the height of the stakes. On a horizontal trellis, the canes are wound around the wires and tied at intervals. On a vertical trellis, the canes are tied to the wires without being wound around them.

Fruited canes are handled as described for red raspberries.

Blueberries

Blueberries are delicious when eaten fresh, are tasty in pies, and easily frozen. However, this fruit is not commonly grown in Illinois and is relatively unknown to many home gardeners. Blueberries have very exacting soil and cultural requirements, but if properly handled can be grown successfully. Soils and locations that naturally provide optimum growing conditions are very limited in Illinois, so careful attention must be given to cultural details.

Soil. Blueberries require an acid soil relatively high in organic matter. A soil pH of 4.2 to 5.2 is best for optimum growth.[1] If your soil pH is between 5.2 and 6.2, make a mixture of half acid peat moss and half top soil. Use this soil-peat mixture in a 2-foot-diameter planting hole that has a depth of 12 inches.

If your soil pH is above 6.2, individual plants can be grown in tubs buried in the garden. Halves of 50-gallon drums, with drainage holes cut in the bottom, are suitable. First, burn out any residues that might be injurious. Bury the drum in a sunny area and leave 1 to 2 inches of the rim above ground level. Fill the tub with an acid soil (pH 4.2 to 5.2) high in organic matter (make a mixture with acid peat moss if necessary). Set one blueberry plant in each tub.

[1] Your county farm adviser can test your soil for a small fee.

BLUEBERRY VARIETIES FOR HOME GARDENS IN ILLINOIS

Variety	Best adapted to northern (N) or southern (S) Illinois	Season	Dessert quality	Notes
Berkeley	N, S	Midseason	Fair	Large berries, productive.
Bluecrop	N, S	Midseason	Good	Large berries. Slightly earlier than Berkeley.
Blueray	N, S	Midseason	Good	Large berries.
Collins	S (trial)	Early Midseason	Good	Attractive large berries.
Coville	N, S	Very late	Good	Good variety to extend season. Berries tart until ripe.
Herbert	N, S	Late	Very good	Productive.
Jersey	N, S	Midseason	Fair	Produces large crop. Growing well in several locations in Illinois.

Blueberry fruit cluster. (Fig. 21)

A vigorous 3-year-old blueberry bush heavily laden with fruit. (Fig. 22)

Irrigation. Blueberries are shallow-rooted and grow best where the water table is 14 to 22 inches below the soil surface. Because of this water requirement, blueberry plants must be irrigated in most parts of Illinois. Don't attempt to grow blueberries unless you can supply needed water when the rainfall is not adequate. In addition, the soil must freely drain as blueberry plants cannot tolerate standing water.

Mulching. Because blueberries are very subject to drouth injury on most Illinois soils, mulching is recommended in addition to irrigation to help stabilize soil moisture. The mulch also helps to supply organic matter. A deep mulch of sawdust or crushed corncobs is best. Apply 4 to 6 inches of mulch soon after the plants are set. Maintain the mulch by adding 2 to 4 inches as needed. Rows can be mulched 3 or 4 feet wide with the area between kept in mowed turf. Otherwise, the entire planting may be mulched to completely control weeds. Leaf mold, pine needles, lawn clippings, straw, or hay can also be used, but sawdust or crushed corncobs are preferred.

Planting and Spacing. Buy 2-year-old plants of medium to large size. Avoid using plants older than 3 years if possible, as the extra cost is not justified, and they may be cull plants that were too weak to sell at a younger age.

The plants should not be set deeper in the soil mixture than they grew in the nursery. Do not let the roots dry out during planting. Carefully spread the roots and firm the soil or soil-peat mixture over them. Blueberry plants should be spaced 6 to 8 feet apart in rows 8 to 10 feet apart. Water thoroughly after planting.

Remove Flowers. Remove all flowers during the first year. Do not permit berries to develop since they will restrict shoot growth.

Fertilizers. Do not apply fertilizer until 4 weeks after planting. Then, sprinkle 1 ounce of ammonium sulfate in a circular band 12 to 18 inches from the base of each plant.

In the spring of the following year apply 1 ounce of ammonium sulfate per plant in late March or early April before the buds begin growth. Increase this amount each year by 1 ounce until a total of 6 ounces per plant is reached. Thereafter each plant will receive 6 ounces annually. A complete fertilizer, such as a 10-6-4 or 10-10-10 analysis, can be used at double the above rates if growth is not vigorous.

Iron deficiency of blueberries has frequently been observed in Illinois. Symptoms are yellowing and mottling of the young leaves. Iron deficiency may be corrected by applying iron chelate to the soil or spraying it on the plant foliage in amounts recommended by the manufacturer.

Pruning a 4- or 5-year-old blueberry bush. Left, before pruning. Right, the same bu after removal of weak and unproductive growth. (Fig.

Pruning. Pruning is generally not needed until the third year after planting (see Fig. 23). In early spring before growth begins, remove dead or injured branches, short and stubby branches near the ground, and old stems low in vigor. After the plants become 5 to 7 years old, it is important to remove all but 3 or 4 of the old branches close to the ground. This will allow vigorous young branches to develop.

Pruning also increases the size of the berry and promotes earlier ripening. If the plants have formed an unusually heavy load of fruit buds, the tips of the fruiting branches can be cut back to leave 4 to 6 fruit buds. Although this reduces yields slightly, the berries are appreciably larger in size. The fruit buds are easily distinguished in the spring because they are large, round, plump buds. Leaf buds are smaller, thinner, and sharply pointed.

Under good growing conditions, vigorous shoots may rapidly develop and grow several feet tall. If these are cut back before August 1, they usually develop strong lateral branches that will bear fruit the following spring. Remove 3 or 4 inches when the shoot is 4 to 5 feet high.

Birds. Birds are a serious pest in blueberry plantings. As the berries ripen, the bushes can be covered with cheesecloth or protective netting.[1] Rabbits and deer may eat twigs and branches when the ground is covered with snow. Fencing is warranted when this problem is severe.

Currants and Gooseberries

Currants and gooseberries are very hardy and easy to grow. They are discussed together since cultural practices are similar.

Currants and gooseberries are alternate host plants for blister rust which is a serious disease of white pines. For this reason, they are prohibited in areas where white pines are planted. These areas include federal, state, and county forests, parks, nurseries or other native or planted white pine areas. If white pines are grown in your vicinity, check with the Illinois Department of Agriculture, Division of Plant Industry, Glen Ellyn, Illinois before planting.

Location. Currants and gooseberries grow best in cool, moist, and partially shaded locations. The north or east side of a building, fence, or arbor may best provide these conditions.

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[1] Special protective netting for fruit plants is available from:
Lumite Division, Chicopee Mfg. Corp., Cornelia, Ga.
Moodus Net & Twine Inc., Moodus, Conn.
Visinet Mill Div., Bemis Bros. Bag Co., 2400 S. Second St., St. Louis, Missouri.
Ethyl Corporation, Visqueen Division, Box 2422, Baton Rouge, La. 70801.

CURRANT AND GOOSEBERRY VARIETIES FOR HOME GARDENS IN ILLINOIS

Variety	Best adapted to northern (N) or southern (S) Illinois	Notes
	Currants	
Crandall	S	Native black currant. Good drouth resistance, succeeds in hot summers. Large berries must be picked singly.
Red Lake	N	Red currant. Vigorous, hardy, productive. Good quality. Large berries.
Viking	N, S (trial)	Red currant. Productive. Immune to white pine blister rust.
White Imperial	N, S (trial)	Pale yellow fruit. Best dessert quality. Not too productive.
Wilder	N, S	Red currant. Productive, large, bright, attractive fruit.
	Gooseberries	
Abundance	N	Large fruit, light purple when ripe. Tough skin.
Glendale	S	Medium dull red fruit with small seeds. Withstands summer heat best of available varieties. Excellent for jam.
Pixwell	N	Light green fruit turns pink when ripe. Few thorns.
Poorman	N	Large red fruit, good quality for eating fresh.
Welcome	N	Dull red fruit, few and small seeds, good quality. Few thorns.

Planting and Spacing. Plants can be set in either fall or spring but securing plants in the fall may be a problem. Spring planting is quite satisfactory but it must be done early before the buds begin growth. Vigorous, well-rooted, one-year-old plants are best. Prune off damaged roots and cut the top back to 10 inches. Set the plants with the lower branches a little below the soil level to encourage a bush form to develop. Space the plants 4 to 6 feet apart in rows 6 to 8 feet apart.

Fertilizer and Mulch. Currants and gooseberries are heavy feeders but have rather shallow root systems. An annual application of barn manure is probably the best source of fertilizer. Strawy manure may be applied each fall (November or later) and maintained 4 to 6 inches deep to provide a soil mulch. Sawdust, corncobs, straw, lawn clippings, or similar materials may also be used.

Gooseberries (left) and currants (right) are easily grown in Illinois. (Fig. 24)

If manure is unavailable and the plants lack vigor, apply 4 ounces of 10-10-10 fertilizer per plant in early spring before growth starts. Double this amount the first year if the plants are mulched with sawdust, corncobs, or fresh straw instead of a strawy manure.

Pruning. Currants and gooseberries require annual pruning for maximum production. Red and white currants and gooseberries develop fruit from buds at the base of one-year wood and from spurs on older wood. The older wood becomes progessively less fruitful and canes older than 3 years are usually unproductive. Pruning consists mainly of selecting the proper type of fruiting wood.

Prune in early spring when the plants are dormant. After the first year, remove the weaker shoots, and leave 6 to 8 strong branches. The second year remove all but 4 or 5 of the two-year-old branches and 4 or 5 of the one-year-old branches. On the third and subsequent years, leave 4 or 5 three-year-old branches, 4 or 5 two-year-old branches, and 4 or 5 one-year-old branches (of the previous season's growth) for a total of 12 to 15 branches per plant. When pruning remove branches that tend to lie on the ground and remove weak branches in the center of the bush to keep the plant from becoming too dense.

Black currants produce best on branches of the previous season's growth (one-year-old). Therefore, they should be pruned more severely than red currants or gooseberries. In early spring remove the branches that produced fruit the preceding year. Remove all but 6 to 8 of the vigorous one-year-old branches. These branches will bear fruit in the present year and new shoots will arise for production next year.

Grapes

Grapes are a popular fruit for home gardens. Some grape varieties ripen from early August until mid-October, thereby providing a long season of fresh fruit. Grapes offer a wide range of flavors, can be used for making juice and jelly, and the trellises and arbors on which they are grown make attractive shaded areas which can be useful in landscape planning for screening off undesirable views.

In recent years, French Hybrid grape varieties have created much interest. The French Hybrids were developed mainly for wine purposes, and most varieties are not suitable for fresh table use.

Planting and Spacing. Grapes should be planted in early spring, as soon as the soil can be prepared. Cut off long or broken roots so that they can be spread evenly in the planting hole. Set the plant slightly deeper than it grew in the nursery, arranging the roots so that they are not bunched together. After planting, prune as directed on page 41.

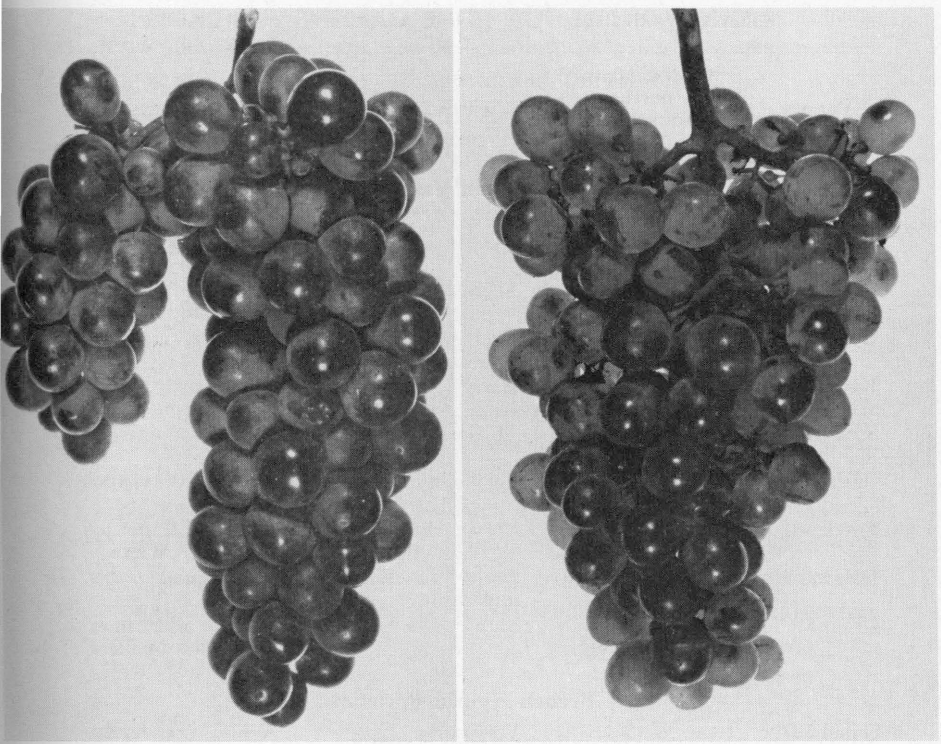
Space the plants 8 feet apart in the row and not less than 8 feet between rows.

Fertilizer. When available, manure is the best fertilizer for grapes. Apply 1 bushel of well-rotted stable manure (or 5 pounds of dry rabbit or poultry manure) around each mature vine. Spread the manure during late winter or early spring in a 4-foot circle around each plant, and not closer than 1 foot from the vine.

Commercial fertilizer may be used if manure is not available or if the vines lack vigor. Apply 2 ounces of a 10-10-10 fertilizer (or equivalent) around each vine shortly after planting. In the early spring of the second year apply 4 ounces, the third year 8 ounces, and thereafter 1 pound per plant. Distribute the fertilizer around the plant as described above. If the soil is high in potassium and phosphorus (see your farm adviser about having the soil tested), 33-percent nitrogen fertilizer can be substituted at one-half the above rates.

Do not apply fertilizer if the vines make excessive growth. Caution and judgment must be used in fertilizing grapes to prevent rank growth which does not mature properly and which is likely to be seriously injured during the winter. Moderate growth of the canes which mature early is preferred. The addition of excessive amounts of fertilizers or other practices which encourage luxurious growth late in the season should be avoided.

Mulching. Cultivate the young grape planting for the first year. Do not cultivate deeper than 3 inches around the plants since the roots are rather shallow.



Grape clusters of Steuben (left) and Seyve Villard 12-375 French Hybrid. (Fig. 25)

After the vines become established the grape planting can be mulched with straw, sawdust, leaves, or corncobs. Caution must be used in mulching grape vines on heavy, wet, or highly fertile soils, for they may suffer winter injury from rank growth and cane immaturity.

Supports. A trellis or arbor should be constructed before the spring following the first growing season. The grape planting is more or less permanent and the support trellis should be built to last 20 or more years. The structure must therefore be strong enough to bear the weight of mature vines and a full crop of grapes.

To build a trellis for the 4-cane Kniffin training system (described below), two wires, approximately 2½ feet apart, are supported by posts which are set about 20 feet apart in the row. Galvanized wire of No. 9 or No. 10 gauge is suggested. The lower wire should be 2½ feet above the ground, and the top wire about 5½ feet above the ground. Durable wood posts (cedar, locust, white oak) should be 3 inches in diameter at the top and 8 to 8½ feet long. They should be set 2½ to 3 feet in the

GRAPE VARIETIES FOR HOME GARDENS IN ILLINOIS

Variety	Best adapted to northern (N) or southern (S) Illinois	Season	Dessert quality	Remarks
		American Varieties		
Buffalo	N, S	Early	Excellent	The best quality blue variety for dessert, juice, jelly.
Concord	N, S	Midseason	Fair	Standard blue grapes, hardy and reliable.
Concord Seedless	N, S (trial)	Early midseason	Fair	Seedless, small, blue. Good for pies.
Kendaia	N, S	Early	Good	Blue, hardy, productive.
Steuben	N, S	Midseason	Very good	Blue, productive, hardy.
Ontario	N, S	Very early	Good	Productive, vigorous. Golden.
Portland	N, S	Very early	Good	Productive, not too vigorous. White.
Delaware	N, S	Early midseason	Excellent	Pink, small.
Urbana	S (trial)	Late	Excellent	Large, pink, must be sprayed for mildew. Keeps well.
		French Hybrid Varieties		
Seibel 5279	N, S	Very early	Good	White, very hardy, wine. Pleasant taste.
Seibel 13053	N, S	Very early	Fair	Small, black. Bird damage. Makes red or rose wine.
Seyve-Villard 5-276	N, S	Early midseason	Fair–Good	White, very productive.
Seyve-Villard 12-375	S, N (trial)	Late midseason	Good	Very productive, vigorous, best white.
Joannes-Seyve 23-416	S, N (trial)	Midseason	Good	Vigorous, healthy vine, long clusters, pink. Makes white wine.
Couderc 71-20	S, N (trial)	Late	Fair	Black, very productive, healthy. Hardy. Makes red wine.

ground. Heavier posts should be used for the ends of the trellis. The end posts should be 5 to 6 inches or more in diameter at the top, and they should be 9 feet long so that they can be set a full 3 feet deep. The end posts should be well braced to keep the trellis wires from sagging. Metal posts may also be used for supporting trellis wires.

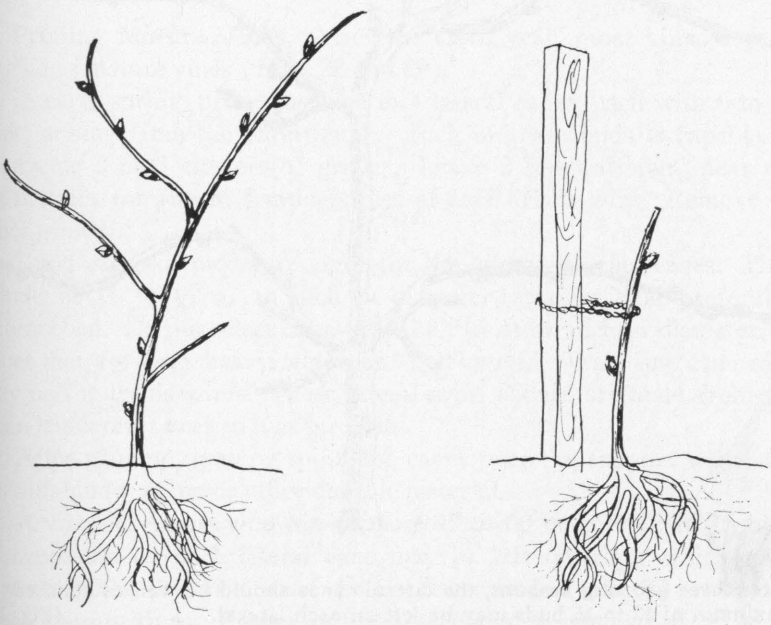
Grapes may also be trained satisfactorily on latticed arbors, fences, or other suitable structures. The shading provided by grape vines growing over arbors may be as important as the fruit crop.

Pruning Young Vines. Annual pruning is essential to maintain vigorous grape vines. The fruit clusters form from buds on one-year-old canes. The vines must be pruned to encourage vigorous canes to develop, to eliminate unproductive old canes, to train fruiting canes, and to limit the number of buds on the vine.

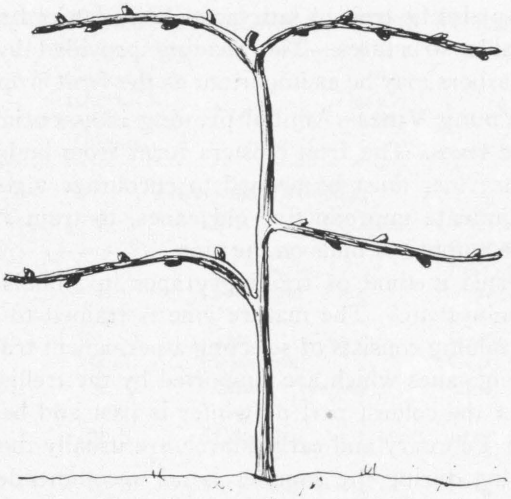
The suggested method of training grapes in Illinois is called the "4-cane Kniffin system." The mature vine is trained to a 2-wire vertical trellis. Training consists of selecting a permanent trunk and 4 one-year-old fruiting canes which are supported by the trellis (Fig. 29).

Prune after the coldest part of winter is past and before the buds begin to swell. February and early March are usually the best times in Illinois. Pruning during the summer is not recommended. The fruit does not require direct sunlight to ripen and develop full color.

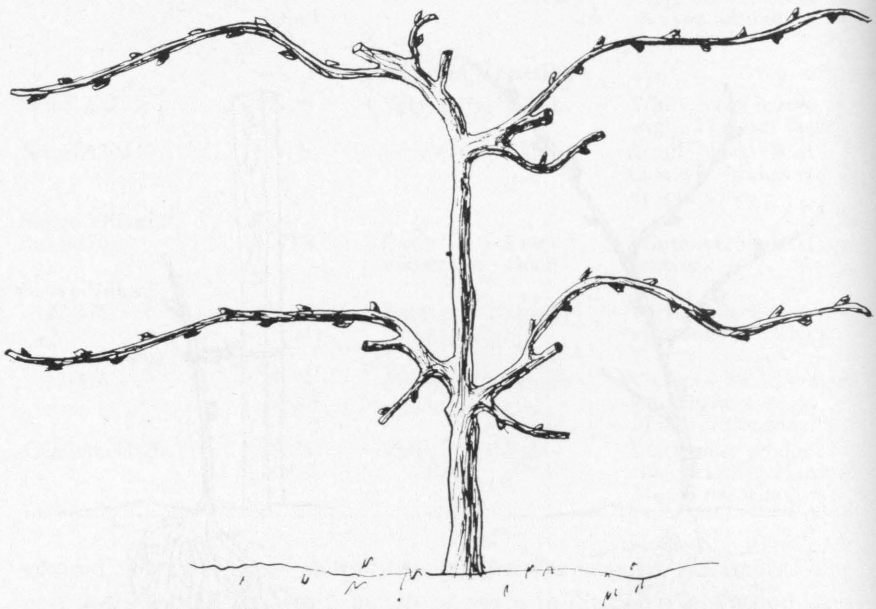
First Year. At planting time, prune the plants to a single stem with 2 buds (see Fig. 26). A shoot will grow from each of the buds left on the young plant. If the trellis is not constructed, tie the most vigorous



A newly planted grapevine before (left) and after (right) pruning. (Fig. 26)



After two growing seasons, 4 lateral canes may develop on vigorous plants, and 4 to 6 buds may be left on each lateral cane. (Fig. 27)



After three growing seasons, the lateral canes should be well established. A maximum of 12 to 15 buds may be left on each lateral. (Fig. 28)

shoot to a stake 4 to 5 feet high. At the end of the first summer the main shoot should be 3 to 4 or more feet high, and may be long enough to reach the top wire of the trellis.

Second Year. In early spring, while the vine is dormant, prune off all but the strongest cane. Tie the cane tautly to the top wire of the trellis or to the lower wire if it is not long enough to reach the top wire. This cane will form the permanent trunk.

During the second growing season, remove shoots that develop below the lower wire. Remove flower clusters.

During the second year, the main trunk should reach the top trellis wire and some short lateral canes may develop.

Third Year. If 1 to 4 strong lateral canes develop during the second year, they may be trained to the trellis wires (Fig. 27). Otherwise, cut the vine back to a single vertical trunk. In either case leave two buds (renewal spurs) on each of two shoots near the lower and upper trellis wires. Fruiting canes for next season grow from these buds.

During the third summer, numerous lateral canes will develop which should bear a good crop during the fourth year. A few grapes may be produced during the third year from the laterals (if any developed during the second year), or from buds on the upper part of the main trunk.

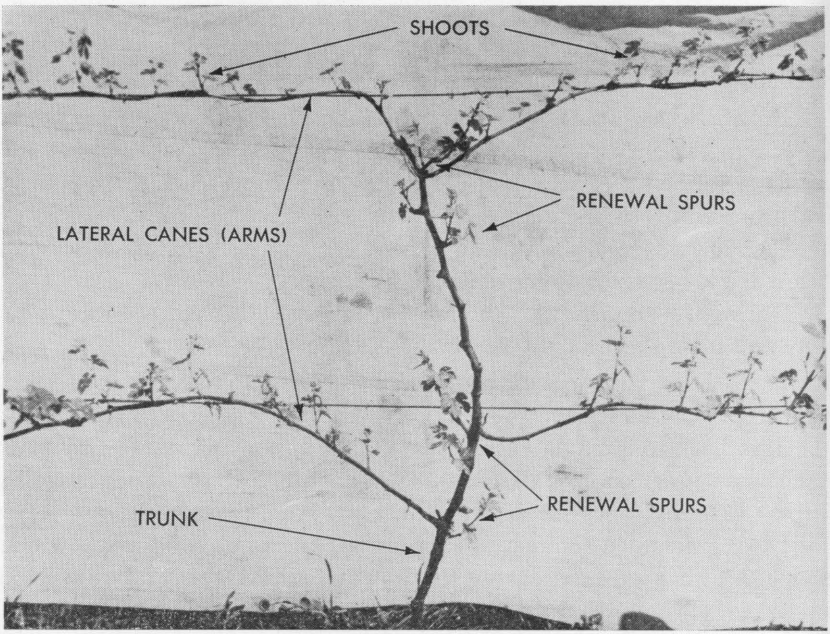
Pruning Mature Vines. After the third year, most vines can be treated as mature vines (Figs. 28 and 29).

In early spring, prune the vine to 4 lateral canes, each with 6 to 12 buds, arising from the main trunk. Each of these buds is capable of producing 2 or 3 clusters of grapes. Leave 2 renewal spurs near the main trunk for future fruiting canes at each trellis wire. Remove all other growth.

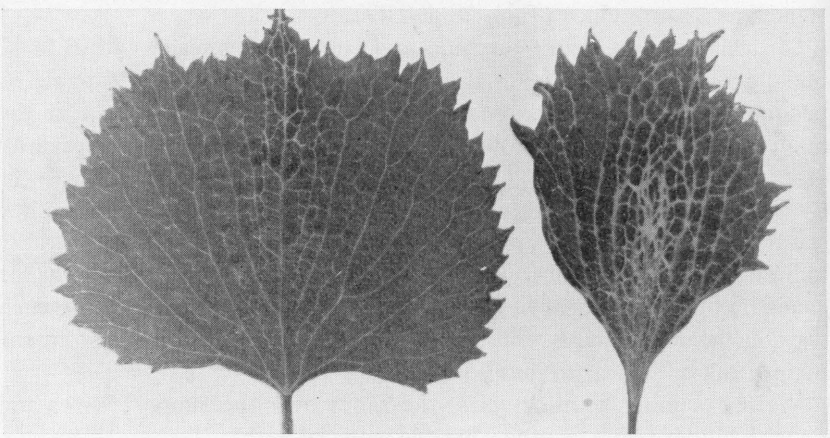
Select canes of moderate vigor for the lateral fruiting canes. They should be ¼ to ⅓ of an inch in diameter, straight, and preferably unbranched. Do not select canes less than ¼ of an inch in diameter, or canes that are long, heavy, vigorous "bull canes." Train one cane each way on the trellis wires. These lateral arms should originate from the main trunk or as near to it as possible.

After pruning, loop or spiral the canes over the support wires and tie with binder twine or other durable material.

A vigorous grape vine can support 45 to 60 buds — 12 to 15 buds at maximum on each lateral cane may be left on vines which grew vigorously the previous year. Leave fewer buds (total 30 to 40) on less vigorous vines. Proper pruning necessitates removal of 80 to 90



A mature grapevine trained and pruned to the 4-cane Kniffin system as it begins growth in the spring. **(Fig. 29)**



2,4-D injury on grape leaves. **(Fig. 30)**

percent of the wood. Many gardeners do not prune severely enough!

Grape vines trained on arbors are pruned in essentially the same manner. Prune to develop a main trunk over the arbor and then allow

4 or 6 evenly-spaced arms to develop. Of course, spurs with buds for renewal of each arm must be left.

Pruning French Hybrids. French Hybrids are pruned to short spurs or short canes rather than long fruiting canes. The plants are best trained to the Munson system. This system and correct pruning techniques for French Hybrids are described and illustrated in Illinois Circular 772, *Pruning and Training French Hybrid Grapes.*

Pruning Neglected Vines. Old vines which have not been pruned for one or more years will be dense and may have several stems or trunks arising from the roots.

Basically the job is to select the frame (main trunk, fruiting arms and renewal spurs) described above. Desirable fruiting wood may be far from the main trunk, and if very severe cutting is necessary it is best to renew the vine gradually (prune half the first year and half the next). If neglected vines have several trunks, remove 2 or 3 each year until only one remains. Select a young cane for the future trunk, if the older trunks are malformed. Prune the older portion of the plant out gradually while maintaining moderate fruit production until the new trunk and arms are ready to bear in 3 years.

Chemical Injury. Grapes are one of the most sensitive plants to many chemicals, particularly herbicides containing 2,4-D. *Do not use* 2, 4-D or sprayers which have contained 2,4-D if you want to grow grapes. Enough 2,4-D can drift ½ to 1 mile by air to ruin your grape crop. Injury may be indicated by misshapen leaves, tendrils, and young shoots. The leaves may have sawtooth edges and may be narrow and fanshaped. The grapes may ripen unevenly or not at all. The symptoms may appear 1 to 3 weeks after exposure to the fumes (Fig. 30).

Pest Control

To have a successful fruit garden, one must be aware of many diseases and insect pests and be prepared to control them. Home fruit growing is usually an avocation rather than a vocation, and a person often has neither the time nor the inclination to spend a great deal of time spraying. Thus, most pest control programs for the home fruit garden are quite limited, although they can also be extremely successful. A well-timed chemical application may mean the difference between a good crop and no crop at all.

Chemicals are not the only answer to pest control, however. Many diseases can be controlled by the use of resistant varieties. Virus diseases can be controlled only by destroying the affected plants. The

establishment and spread of some virus diseases can be prevented by the chemical control of sucking insects such as the aphids and leafhoppers. Also, chemicals should only be used as a supplement to good sanitation measures. It is because sanitation practices are not adequate in themselves that chemicals are necessary.

For pest control the home gardener may choose all-purpose mix formulations or individual chemicals. All-purpose mixes that contain several chemicals in one package are especially convenient for the home fruit gardener. The mixture may include one or two insecticides, one or two fungicides, and sometimes an acaricide. They are formulated for use as dusts, or so as to be mixed in water for spraying. Their only disadvantage is that sometimes the concentration of a particular chemical may not be sufficient to give good control. In the home fruit garden, however, their use is encouraged, particularly for the novice. Use them as directed on the package label.

If a person wants to maintain a supply of separate chemicals he can prepare an all-purpose spray mix and adjust it to meet the various pest control needs. The following table gives the composition of such a spray.

	Gallons of water		
Materials	*1*	*3*	*5*
Methoxychlor, 50-percent wettable powder	2 tablespoons	6 tablespoons	1 cup
Malathion, 25-percent wettable powder	2 tablespoons	6 tablespoons	¾ cup
with either			
Captan, 50-percent wettable powder	2 tablespoons	6 tablespoons	¾ cup
Ferbam, 76-percent wettable powder	2½ tablespoons	½ cup	¾ cup

There are other materials that may be needed at certain times. Karathane (1 teaspoonful per gallon) or wettable sulfur (2 tablespoons per gallon) may be needed for control of powdery mildew. Kelthane AP (2 tablespoons per gallon) is excellent for mite control. These materials may be combined with the all-purpose mix or used separately.

One should not attempt to prepare an all-purpose dust. Dusts are special formulations containing pesticides at proper concentrations in a suitable carrier. They are conditioned to prevent caking, to adhere well to the plant, and to prevent excessive drift. If one prefers to use dusts he should purchase these already prepared.

Often chemical sprays are not applied thoroughly enough for the best results. In this respect, a good axiom to remember is "one good spray is worth more than two poor ones." The best measure of coverage is to spray until the foliage starts to drip. At this point, the maximum

LIMITATIONS ON USE OF PESTICIDES[a]

Crop	Captan	Ferbam	Karathane	Kelthane	Malathion	Methoxychlor	Sulfur
	(days before harvest for last permissible application)						
Blueberries.....	unlimited use	40	not used	2	1	14	not used
Blackberries and raspberries...	unlimited use	40	7	2	1	3	only when dormant
Currants.....	not after fruit forms	14	not used	not used	1	not used	not used
Gooseberries....	not after fruit forms	14	21	not used	3	14	unlimited use
Grapes.....	unlimited use	7	21	7	3	14	not used
Strawberries....	unlimited use	14	21	2	3	14	unlimited use

[a] Limitations in effect at the time of publication of this circular. Changes may be made from time to time.

amount has been applied. Further spraying will merely increase the drip or runoff.

Pesticides are extremely poisonous and should be stored out of reach of children. They should be used according to the restrictions placed upon them by the Food and Drug Administration and the United States Department of Agriculture. Also, the pesticides discussed above are subject to certain restrictions that are in effect at the time of the publication of this circular. (See the table above.) The label on the package gives the latest information about the correct usage. If used according to label specifications, there should be no residue problems. However, if any visible residue remains by harvest time, the fruits should be washed with water before they are eaten or processed.

Because of space limitations, it will not be possible to describe in detail all of the diseases and insect pests which attack the small fruits. The intent here is merely to give suggestions for control that are simple and easy for the home gardener to follow. For further information about diseases and pests of specific plants, see the list of publications on page 52.

Strawberries

Strawberries can be extremely successful when a small number of precautions are taken against pests. The most damaging insects are the strawberry weevil, which is called "clipper" because it kills the buds and fruit by severing the stems, leaving them hanging as though they

had been partly broken off; the "cat-facing" insects (many different sucking insects) which produce a deformed, low-quality berry; the crown borer, a white, thick-bodied grub, 1/5 inch long, which feeds inside the plant at the soil level so that it dies or is weakened; and white grubs, large grubs, up to 1 inch long, which kill the plant by feeding on the roots. The important diseases are gray mold which kills the blossoms and rots the fruit, and red stele, a soil fungus which infects the roots and kills the plant. Leaf spots may be symptoms of some diseases.

Sanitation. Use of cultural and sanitary practices is of utmost importance in controlling various diseases and insects of the strawberry. The following practices are recommended:

1. Do not plant strawberries on sod land until it has been under cultivation for at least two years. If this is not possible, treat the soil before planting by working any one of the following chemicals into the soil to a depth of 2 to 4 inches.

Chemical	*Amount per 1,000 square feet*
Aldrin (in spray or drench),	
5-percent granular or dust	1½ pounds
25-percent wettable powder	5 ounces
Chlordane, 10-percent granular or dust	2½ pounds
Dieldrin, 2½-percent granular	4 pounds
25-percent wettable powder	5 ounces

The soil treatments may be applied in dry form either by hand or with a fertilizer spreader.

2. To control crown borer, separate new beds at least 350 yards from old beds, and plow up the infested patch.

3. When possible, choose varieties that are resistant to disease (see page 11).

4. Renovate beds immediately after each harvest.

5. Use essentially virus-free plants for new plantings. The reliable nurseries have virus-free plants so that they are readily available to everyone.

6. Since Verticillium wilt is a soil-borne disease which enters the plant through the root, avoid planting strawberries after solanaceous plants such as tomatoes, potatoes, peppers, eggplant, melons, or roses.

Spray Schedule. The home gardener will find the following spray schedule effective.

1. *Early bloom.* Apply the all-purpose mix (with captan) at the appearance of the first blossoms. This controls the "clipper" weevil, the cat-facing insects, spittlebug, leaf scorch, leaf spot, gray mold, and blossom blight.

2. *Cover sprays.* Apply captan (2 tablespoons per gallon) every 7 to 10 days following the early-bloom spray for disease control. Use until harvest, if necessary. If leaf-roller insects or spittlebugs appear, include malathion in one of the captan sprays. If mites appear, Kelthane should also be included. Sometimes powdery mildew develops on strawberries in which case sulfur can be used.

3. *Post-harvest sprays.* After renovation, and while the new runner plants are developing for the next year, protect them from insect and disease damage by an occasional spray of the all-purpose mix with ferbam.

Brambles

Sanitation. Certain diseases of brambles cannot be controlled by the use of chemical sprays. These are: crown gall, a bacterial disease which produces large tumor-like growths on the roots; orange-rust (on blackberries), a systemic fungus disease which greatly reduces plant vigor and productivity and which each spring appears as masses of bright orange spores on the leaves; and three virus diseases which are characterized by their names, leaf mosaic, leaf curl, and streak (dark blue or violet blue markings which appear longitudinally on the canes from the ground up).

The following sanitary procedures should be observed:

1. Do not replant on a site where diseased plants have been recently grown.

2. Select resistant varieties.

3. Order stock from a reliable nursery.

4. Plant red raspberry varieties 300 to 500 feet from black and purple varieties to protect from serious injury by mosaic, a virus disease which causes a leaf mottle and which is frequently present but masked in the reds.

5. As soon as diseased plants are detected, dig them up with as many of their roots as possible, and burn them at once.

6. At planting time, cut off old stubs of two-year-old nursery stock and "handles" of young purple and black raspberries. These are left on the plant by the nursery to facilitate handling. The old stubs are usually infected with anthracnose, a fungus disease which causes a gray bark on red raspberry canes and lesions on the canes and leaves of black raspberries.

7. Remove and burn old fruiting canes immediately after harvest. At the same time, cut out surplus canes, weak canes, and those showing injuries of any kind. Prune out canes that do not leaf-out normally in the spring.

8. Remove wild raspberries and blackberries and neglected patches of domestic varieties from the vicinity of your planting, since they are a source of disease.

9. To protect against Verticillium wilt (caused by a fungus in the soil which infects the roots and invades the vascular tissue of the plant thereby causing it to wilt), do not plant brambles in areas that have recently grown any of the solanaceous plants such as tomatoes, potatoes, peppers, eggplant, melons, or roses.

10. Keep your plantings as free from weeds as possible to discourage infestations of insects.

Spray Schedule. Use the following spray schedule for raspberries and blackberries.

1. *Delayed dormant.* Apply this spray in the spring after growth has started, but preferably before the leaflets are ⅜ inch long. It is primarily for the purpose of reducing the anthracnose disease problem, but will also help control certain insects, mites and other diseases. *Use dry lime sulfur, ½ pound to 1 gallon of water.* This is a very important spray and should be applied thoroughly every spring.

2. *Cover sprays.* Apply every 7 to 10 days after the delayed dormant spray as needed. The last two cover sprays should be applied immediately before the bloom and immediately after the bloom. Use the all-purpose mix with ferbam.

3. *Special sprays.* Should a mite infestation develop between the last cover spray and harvest, apply Kelthane AP. Mites are very small 8-legged spider-like insects which cause a bronzing of the foliage.

Immediately after harvest and as needed thereafter (not more often than at 10-day intervals), sprays may be needed for control of anthracnose and mites. Use ferbam and Kelthane AP.

Blueberries

Because they are a new crop in Illinois, the pest control problem of blueberries is thus far practically non-existent. There are patches several years old in Illinois that have never been sprayed or treated because up to this time control has not been needed. But if pest control is needed, use the all-purpose mix with captan, and apply 3 sprays 10 days apart, starting immediately after bloom. A fourth spray may be needed in the northern third of Illinois if fruit fly is present.

Currants and Gooseberries

These fruits require a very minimal spray program. The important insects, for both fruits, are the currant aphid which causes bright red,

cupped, distorted, or wrinkled areas on the leaves; the imported currant worm, which is about 1 inch long, is greenish with black spots, and feeds on the edges of the leaves; the cane borer, a worm, ½ inch long which burrows the entire length of the cane and dwarfs the plant; and scale insects whose very small, grayish, nipple-shaped bodies can be seen on the bark. The important diseases are anthracnose which causes a spotting of the leaves, and a yellowing which is most pronounced on the gooseberry; cane blight which may suddenly wilt and kill scattered canes or bushes; and powdery mildew, particularly on gooseberry, which forms white patches on the surface of leaves, shoots, and berries, eventually distorting them. For these as well as other insect and disease problems the following spray schedule should be effective.

1. *Delayed dormant.* To control anthracnose and powdery mildew on gooseberries, apply in the early spring after growth starts and the leaves are unfolding. Do not apply on currants. Use dry lime sulfur, ¼ pound to 1 gallon of water.

2. *Cover sprays.* Apply the first cover spray when both gooseberries and currants are in full foliage. Apply the second cover spray about 2 weeks after bloom. Use the all-purpose mix with ferbam.

3. *Special sprays.* In addition to the above, special sprays of wettable sulfur may be needed on gooseberries for powdery mildew control. Some years it may be needed at 7-day intervals at least 4 times before harvest.

Grapes

Grapes respond well to pesticidal chemicals. The grape berry moth which causes wormy fruits, and leafhoppers which are small brightly colored insects which feed on the leaves and produce tiny whitish spots and sickly appearing plants, are the most troublesome insects. The important fungus diseases are black rot, which causes brownish circular leaf spots and wrinkled, dried-up fruit; and downy mildew which results primarily in a scorched appearance of the leaves.

Apply the first cover spray when the new growth is 2 to 4 inches long. Apply the second cover spray just before bloom. Use the all-purpose mix with ferbam. Apply the third cover spray just after bloom, when the berries have set, and the fourth cover spray about three weeks after the third. Use the all-purpose mix with captan.

References

The following references are listed for gardeners seeking more detailed information on varieties, culture, propagation, and disease and insect control of the small fruits.

Books

Handbook on Fruits in the Home Garden, Brooklyn Botanic Garden, Brooklyn, N. Y.

How to Control Plant Diseases in Home and Garden, M. C. Shurtleff, Iowa State University Press, Ames, Iowa, 1962.

Modern Fruit Science; Orchard and Small Fruit Culture, N. F. Childers, Horticultural Publications, Rutgers University, New Brunswick, New Jersey, 3rd edition, 1966.

The Pruning Manual, E. P. Christopher, Macmillan Co., New York, 1960.

Small Fruit Culture, J. S. Shoemaker, McGraw-Hill, Inc., New York, 3rd edition, 1955.

Small Fruits for Your Home Garden, J. H. Clarke, Doubleday and Co., Garden City, N. Y., 1958.

Circulars and Pamphlets

The circulars listed below may be obtained from the Agricultural Information Office, 112 Mumford Hall, University of Illinois, Urbana 61801. (Single copies free.)

C 819 Strawberry growing in Illinois. 64 pp.
C 772 Pruning and training French Hybrid grapes. 24 pp.

The following bulletins may be obtained from the Office of Information, U. S. Department of Agriculture, Washington, D. C. 20025.

FB 1043 Strawberry varieties in the United States. 20 pp.
FB 2140 Strawberry diseases. 24 pp.
FB 2184 Strawberry insects. 20 pp.
FB 2165 Growing raspberries. 20 pp.
FB 2208 Controlling diseases of raspberries and blackberries. 16 pp.
FB 2160 Growing blackberries. 12 pp.
FB 1951 Blueberry growing. 34 pp.

The publications listed below may be obtained from the Department of Horticulture, 124 Mumford Hall, University of Illinois, Urbana 61801.

FG 7 Combination all-purpose spray schedule for the home fruit garden.
FG 11 The leaf-bud method of propagating brambles.
FG 15 Sources of small fruit plants.

The publications listed below may be obtained from the Department of Plant Pathology, 218 Mumford Hall, University of Illinois, Urbana 61801.

FL 1 Strawberry spray and dust guide.
FL 4 Pest control guide for blueberries, brambles, grapes, gooseberries, currants.
PD 700 Raspberry anthracnose.
PD 701 Strawberry red stele root rot.
PD 702 Strawberry leaf spot diseases.
PD 703 Black rot of grape.
PD 704 Gray mold of strawberry.
PD 705 Downy mildew of grape.

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